Dr Rajiv Ganguly

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
T3- EXAMINATION (December - 2017)
M. Tech. (I- SEM.)

COURSE CODE: 14M31CE113 MAX. MARKS: 35
COURSE NAME: Water Supply and Treatment
COURSE CREDIT: 3 MAX. TIME: 2 HRS

Note: Attempt all questions. Assume suitable data if required. Carrying of mobile phone during examinations will be treated as case of unfair means

1. A flocculator is designed to handle a flow of 70,000 m^3/d. The alum dosage required is 55 mg/l. Assume Gt value of 4.5×10^4 and temperature of water is at 25^0C. Assume a μ of 1.002×10^{-3} N.s/m^2. Design the flocculator and draw neat sketches of the configurations **(5)**

2. With a neat sketch, derive the condition for two-film theory. In this context also explain the reason for modification in the derived equation for super saturated systems. Mention the treatment system in which the two-film theory plays a significant role **(3)**

3. Derive the expressions with explanation of proper terms for (a) principles of an aeration system and (b) Karmen-Cozeny Equation for filtration. **(2+2)**

4. The solid concentration of sludge is 4000 mg/l and underflow concentration is 18000 mg/l. The discharge is 0.05 m^3/s. The variation of the interface height with time is as shown below. Determine the area of the thickener **(4)**

Interface (cm)	50	40	30	28	25	23	21	18	17.5	17.5
Time (min)	0	15	20	21	23	25	28	29	45	50

5. Determine the head loss across a bed of non-uniform sized sand for a filter rate of 8.0 m/h and temp of water is 20^0C. The depth of filter bed is 0.85 m deep and has an overall specific gravity of 2.75. The porosity and shape factors are 0.48 and 0.86 respectively throughout the bed. Assume density of water as 999.2 kg/m^3 and μ of 1.002×10^{-3} N.s/m^2. Also determine the head loss if uniform sized soil grains were to be utilized. Also calculate the permeability of the sand bed **(5)**

Average size (mm)	1.0	0.71	0.54	0.46	0.38	0.32	0.27	0.23	0.18
Mass retained (%)	0.87	8.63	21.30	28.10	23.64	7.09	3.19	2.16	1.02

6. Design a spray aerator system to aerate a flow of 50 MLD. The iron concentration present in water is 1.9 mg/l and the permissible value is 0.3 mg/l. The aeration constant is 85 cm/h and saturation concentration of oxygen is 8.5 mg/l **(5)**

7. With a neat sketch, briefly explain the process of break point chlorination in water. **(3)**

8. A settling column analysis is run on suspension type-II and the results of the analysis are shown below. Using this table determine (a) theoretical efficiency of a settling basin with a depth of 3.5 m having a volume of 1400 m^3 and inflow rate of 14,400 m^3/d (b)) theoretical efficiency of a settling basin with a depth of 2.5 m having a volume of 2200 m^3 and inflow rate of 13,200 m^3/d. **(6)**

	Time (min)							
Depth (m)	0	40	80	120	160	200	240	280
0.5	820	369	238	164	107	66	41	33
1.0	820	442	369	279	213	164	115	90
1.5	820	631	476	361	287	230	180	148
2.0	820	672	558	426	353	287	238	187
2.5	820	713	590	492	402	344	282	230
3.0	820	722	615	533	460	394	320	262
3.5	820	738	656	574	492	418	360	303